REMARKS

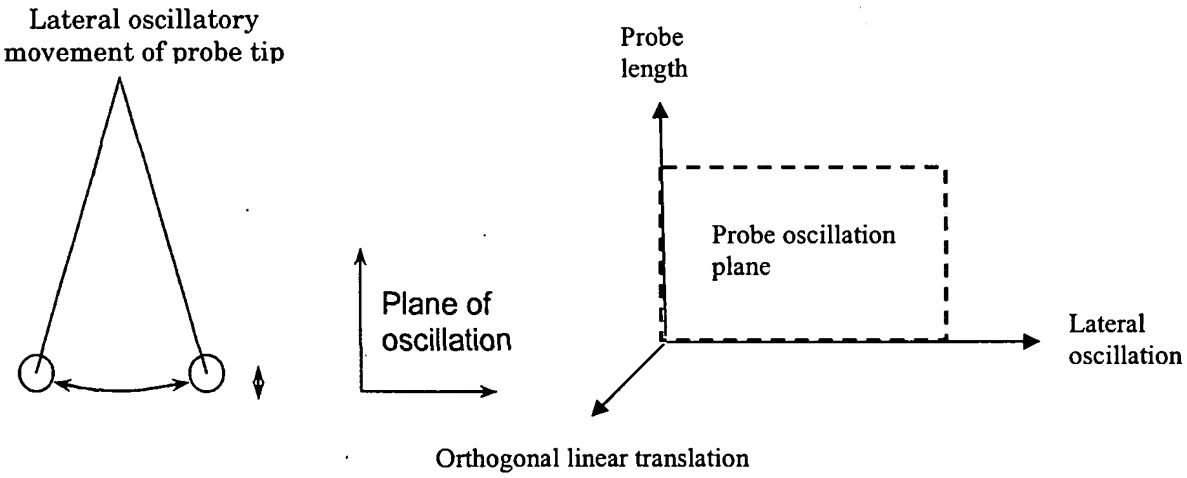
Claims 1-19 and 21-23 are currently pending in this application. Claim 22 has been withdrawn from consideration as being directed to a non-elected species of invention. By way of this Reply, independent claims 1, 21, and 23 have been amended, without prejudice, to provide additional clarification to the meaning of the term "scan line" in accordance with the accepted meaning of this term in the microscopy industry. In addition, claims 17 and 18 have been amended, without prejudice, to further define the claimed invention. Applicants submit that no new matter has been introduced into the application by these amendments.

Claim Rejections – 35 U.S.C. § 112, second paragraph

Claims 17 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. In particular, the Office Action states that it is "unclear how providing a linear translation of the probe and sample in a direction orthogonal to a plane in which the probe is (laterally) oscillated, defines a rectangular scan area. As understood, such a linear translation of the probe only moves the probe vertically (up and down; orthogonal to the lateral oscillation plane). In Applicant's explanation, the broken arrow of Fig. 4 is still in the plane in which the probe is oscillated." See Office Action at pg. 2.

Applicants respectfully traverse this rejection, and have amended claim 17, without prejudice, to provide further clarification to assist the Examiner's understanding of this claim. Claim 17, as amended, (read in view of claims 1 and

12 from which it depends) recites that the probe is oriented substantially vertically and laterally oscillated across the sample surface. The lateral oscillation of the probe provides a probe oscillation plane defined by the vertical orientation of the probe (*i.e.* length of the probe) and direction of oscillatory motion of the probe tip which is orthogonal to the orientation of the probe. The lateral oscillation of the probe and resulting probe oscillation plane can be illustrated as follows:



Claim 17 further recites that "the driving means (16, 22) is arranged to provide a relative linear translation of probe (20) and sample (12) in a direction substantially orthogonal to a probe oscillation plane." A direction substantially orthogonal to the probe oscillation plane will be outside of this as illustrated by the broken arrow line in Figure 4. Such linear translation of the probe and sample results in the substantially rectangular scan pattern shown in Figure 4.

Thus, the Examiner's understanding that "such a linear translation of the probe only moves the probe vertically (up and down; orthogonal to the lateral

oscillation plane)" is incorrect. Furthermore, based on well recognized geometric principles, it follows that the direction of the broken arrow line in Figure 4 (illustrating the direction of linear translation of the probe and sample) cannot be in the probe oscillation plane.

Based on the foregoing, Applicants respectfully request withdrawal of the indefiniteness rejection of claim 17.

Claim Rejections – 35 U.S.C. § 102(b)

Claims 21 and 23 remain rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,254,854 (Betzig). With respect to the rejection of claims 21 and 23, the Office Action states, in pertinent part:

> Betzig discloses a scanning probe microscope and method for scanning a sample by means of interaction between the sample and probe, ... the microscope is arranged, in operation, to carry out a scan of the sample surface wherein scan area is covered by an arrangement of scan lines (see generally Fig. 8), each scan line (not shown) provided by laterally oscillating (see col. 3, lines 10-12) either the probe or the sample near resonant frequency (see col. 3, lines 25-30). The oscillation amplitude inherently determines a maximum scan line length.

See Office Action at pg. 3. Applicants respectfully traverse the stated grounds for rejection, and submit that the Office Action misinterprets the meaning of the claimed term "scan line" to support this rejection.

Independent claim 21 of the present invention recites, in pertinent part:

> Laterally oscillating either the probe (20, 54) across the surface of the sample (12) at or near its resonant frequency or the sample (12) beneath the probe (20, 54) at or near its resonant frequency to provide a relative oscillatory motion between the probe (20, 54) and surface

> such that an arrangement of scan lines, whose maximum length is directly determined by oscillation amplitude, covers the scan area, each scan line comprising a plurality of readings;

Similarly, independent claim 23 of the present invention recites, in pertinent part:

> the microscope (10, 50) is arranged, in operation, to carry out a scan of the sample surface wherein a scan area is covered by an arrangement of scan lines, each scan line involving a plurality of readings and being provided by laterally oscillating either the probe (20, 54) or the sample (12) at or near its resonant frequency such that oscillation amplitude directly determines maximum scan line length and the arrangement of scan lines is provided by operation of the driving means (16, 22).

In response to Applicants' argument that Betzig does not disclose that each scan line is provided by means of a resonant oscillation and that each scan line has a maximum length determined by oscillation amplitude as recited in claims 21 and 23 of the present invention, the Office Action states that the term scan line must be interpreted in view of the claim language stating that that the maximum length of a scan line is determined by the oscillation amplitude, and that in Betzig the amplitude of the resonant oscillation of the probe tip corresponds to the amplitude of the scan line referred to in claims 21 and 23 of the present application. See Office Action at pg. 8. Applicants respectfully traverse the stated grounds for rejection, and submit that the Office Action misinterprets the well accepted meaning of the claimed term "scan line" to support this rejection.

One of ordinary skill in the art in the field of microscopy would interpret the term "scan line" as a collection of a plurality of separate readings taken along a line which are used to build up an image of the sample. See enclosed Declaration of

Andrew David Laver Humphris ("Humphris Declaration") at ¶ 13. In support of this interpretation, attached as Exhibit "A" to the Humphris Declaration is a copy of pages 59-61 of from the Nanoscope User Guide from Veeco Instruments, which uses the term "scan line" in accordance with its well recognized meaning in the field of microscopy.[1] In particular, on pg. 61 under the heading "samples/line," the User Manual references selecting "the number of sample data points per scan line," with the range being 128 to 16384 sample points per line. The meaning of this term is further exemplified in the User Manual stating "samples/line should be kept at 512 or higher for high resolution scans." See Humphris Declaration at ¶ 14 and Exhibit "A" at pg. 61. Applicants have amended independent claims 1, 21, and 23, without prejudice, to expressly recite that "each scan line involving a plurality of readings" in accordance with the well accepted meaning of this term.

Similarly, U.S. Patent No. 6,752,008 (Kley) at column 4, lines 3-18 provides a clear description of the accepted meaning of the term scan line which accords with the definition of "a collection of a plurality of separate readings taken along a line which are used to build up an image of the sample." Humphris Declaration at ¶ 16.

Thus, the term "scan line" as used in the present invention should be interpreted in view of its well accepted meaning in the microscopy industry as a laterally extending line along which a plurality of separate readings are taken.

[1] As Veeco Instruments has a majority of market share in total atomic force microscopy (AFM) sales, the use of the term "scan line" in this manual is illustrative of the well accepted meaning in this industry. Humphris Declaration at ¶ 15.

Humphris Declaration at ¶ 17. Furthermore, claims 21 and 23 require that each scan line must be provided by oscillating either the probe or sample at or near resonant frequency and that the maximum length of the scan line is determined by oscillation amplitude.

In Betzig, the probe is resonantly oscillated about each reading or measurement position and the amplitude of the resonant oscillation corresponds to that measurement alone, which, in turn, corresponds to a single pixel in the image of the surface that is produced. Humphris Declaration at ¶ 19. Once the measurement has been recorded, the probe in Betzig is moved/translated in a line to a new position where a new reading, for an adjacent pixel, would be taken by oscillating the probe about the new measurement position. Id. This pattern of individual measurements is then repeated at new positions along the line until the readings for a complete scan line are recorded. Id. It is possible for the average position about which the probe is being resonantly oscillated to be moved/translated continuously and the individual measurements recorded as the probe moves/translates along the line. Id.

A person of ordinary skill in the field of microscopy would understand the lines 170 illustrated in Fig. 8 of Betzig would be "scan lines." Humphris Declaration at ¶ 20. Thus, the "scan lines" in Betzig are not provided by means of resonant oscillation of the probe, but are determined with respect to the number of

measurements to be taken and translation of the probe along the scan line 170. Humphris Declaration at ¶ 21.

Furthermore, the amplitude of the resonant probe oscillation in Betzig relates only to the +/- divergence from the precise measurement position for each individual measurement position. Humphris Declaration at ¶ 22. Thus, the amplitude of the probe oscillation in Betzig would not be understood by a person of ordinary skill in the field of microscopy as corresponding to the length of a scan line as recited in independent claims 21 and 23. Id.

Accordingly, withdrawal of the anticipation rejections of claims 21 and 23 over Betzig is respectfully requested.

Claim Rejections – 35 U.S.C. § 103(a)

1. Betzig in view of Elings et al.

Claims 1, 3, and 12-18 remain rejected under 35 U.S.C. § 103(a) as being obvious over Betzig in view of U.S. Patent No. 6,008,489 (Elings et al.). In support of these rejections, the Office Action applied Betzig for the reasons set forth above with respect to claims 21 and 23. See Office Action at pg. 4. Noting that Betzig fails to disclose "responding to a variation in an average value of the at least one parameter," the Office Action further applied Elings asserting that it teaches "averaging values." See Office Action at pg. 4.

Similar to claims 21 and 23, independent claim 1 of the present invention recites, in pertinent part:

> the microscope (10, 50) is arranged, in operation, to carry out a scan of the sample surface wherein a scan area is covered by an arrangement of scan lines, each scan line involving a plurality of readings and being provided by laterally oscillating either the probe (20, 54) or the sample (12) at or near its resonant frequency such that oscillation amplitude directly determines maximum scan line length and the arrangement of scan lines is provided by operation of the driving means (16, 22).

As set forth in detail above, Betzig fails to teach or suggest that each scan line has a plurality of readings and is provided by means of a resonant oscillation and that each scan line has a maximum length determined by oscillation amplitude as recited in independent claim 1. Thus, Applicants respectfully submit that Betzig is distinguishable from independent claim 1 for the same reasons set forth in detail above with respect to claims 21 and 23. Furthermore, Elings does not resolve the above-noted shortcomings of Betzig.

Accordingly, withdrawal of the obviousness rejection of independent claim 1 is respectfully requested. In addition, claims 3 and 12-18, which depend from claim independent claim 1 are distinguishable from the cited prior art for the same reasons.

2. Kley in view of Betzig and Elings

Claims 1-4, 6-19, and 21 remain rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,752,008 (Kley) in view of Betzig and Elings. Claim 5 remains rejected under 35 U.S.C. § 103(a) as being unpatentable over Kley in view of Betzig and Elings and further in view of U.S. Patent No. 6,614,227 (Ookubo). In support of these rejections, the Office Action states, in pertinent part:

> Kley discloses a scanning probe microscope and method for scanning a sample by means of interaction between the sample and probe, ... the microscope is arranged, in operation, to carry out a scan of the sample surface wherein scan area is covered by an arrangement of scan lines (see Fig. 8), each scan line provided by laterally oscillating either the probe or the sample at frequency. The oscillation amplitude inherently (see Fig. 3) determines a maximum scan line length. ... Kley does not specifically disclose a feedback mechanism or oscillating at or near a resonant frequency. Betzig teaches (see col. 3, lines 25-30 and col. 5, lines 35-50) oscillating a resonant frequency and providing feedback as claimed.

See Office Action at pgs. 5-6. Applicants respectfully traverse this rejection for the reasons discussed below.

Neither Kley, Betzig, nor Elings, taken alone or in combination, teach or suggest a "scan line" having a plurality of readings provided by resonant oscillation. The Office Action expressly admits that Kley does not disclose resonant oscillation. See Office Action at pg. 6. As noted above, the Office Action applied Betzig for its disclosure of resonant oscillation. As discussed in detail above with respect to the rejections of claims 21 and 23, the resonant oscillations of Betzig are used to take a single measurement, and are not used to provide a "scan line" having a plurality of readings. Thus, the combination of Kley and Betzig fails to teach or suggest that each scan lines has a plurality of readings and is provided by resonant oscillation. Elings also fails to resolve this deficiency in Kley and Betzig (see Humphris Declaration at ¶¶ 23-25).

Furthermore, none of the cited prior art references, taken alone or in combination, teach or suggest that each scan line has a maximum length determined by oscillation amplitude as recited in independent claim 1.

Accordingly, withdrawal of the obviousness rejection of independent claims 1 and 21 is respectfully requested. In addition, claim 2-4 and 6-19, which depend from claim independent claim 1 are distinguishable from the cited prior art for the same reasons.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing remarks, Applicants respectfully submit that the present application, including claims 1-19 and 21-23, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

Miles et al.

By Ryan W. O'Donnell
Ryan W. O'Donnell
Registration No. 53,401

Volpe and Koenig, P.C.
United Plaza, Suite 1600
30 South 17th Street
Philadelphia, PA 19103
Telephone: (215) 568-6400
Facsimile: (215) 568-6499

RWO/
Enclosure (Declaration of Andrew David Laver Humphris)